



СРПСКИ АРХИВ
ЗА ЦЕЛОКУПНО ЛЕКАРСТВО
SERBIAN ARCHIVES
OF MEDICINE

Address: 1 Kraljice Natalije Street, Belgrade 11000, Serbia

+381 11 4092 776, Fax: +381 11 3348 653

E-mail: office@srpskiarhiv.rs, Web address: www.srpskiarhiv.rs

Paper Accepted*

ISSN Online 2406-0895

Original Article / Оригинални рад

Emilija Novaković^{1,2,*}, Mirjana Stojanović-Tasić^{1,2}, Tatjana Novaković², Aleksandra Dutina¹, Zoran Bukumirić³, Ivana Stašević-Karličić^{1,2}

COVID-19 vaccination predictors among people with mental disorders

Предиктори за избор вакцинације против ковида 19
код особа са менталним сметњама

¹Dr Laza Lazarević Clinic for Mental Disorders, Belgrade, Serbia;

²University in Priština – Kosovska Mitrovica, Faculty of Medicine, Kosovska Mitrovica, Serbia;

³University in Belgrade, Faculty of Medicine, Belgrade, Serbia

Received: September 15, 2023

Revised: December 24, 2023

Accepted: January 24, 2024

Online First: January 25, 2024

DOI: <https://doi.org/10.2298/SARH230915010N>

***Accepted papers** are articles in press that have gone through due peer review process and have been accepted for publication by the Editorial Board of the *Serbian Archives of Medicine*. They have not yet been copy-edited and/or formatted in the publication house style, and the text may be changed before the final publication.

Although accepted papers do not yet have all the accompanying bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: the author's last name and initial of the first name, article title, journal title, online first publication month and year, and the DOI; e.g.: Petrović P, Jovanović J. The title of the article. *Srp Arh Celok Lek*. Online First, February 2017.

When the final article is assigned to volumes/issues of the journal, the Article in Press version will be removed and the final version will appear in the associated published volumes/issues of the journal. The date the article was made available online first will be carried over.

***Correspondence to:**

Emilija NOVAKOVIĆ

Dr Laza Lazarević Clinic for Mental Disorders, Belgrade, Višegradska 26, 11000 Belgrade, Serbia

E-mail: emanovakovic95@yahoo.com

COVID-19 vaccination predictors among people with mental disorders

Предиктори за избор вакцинације против ковида 19 код особа са менталним сметњама

SUMMARY

Introduction/Objective Higher rates of morbidity and mortality from the infection of COVID-19 have been recorded among people with mental disorders, especially among those suffering from severe forms, so they should be prioritized during vaccination campaigns. The aim of this study was to examine possible predictors of acceptance of vaccination against COVID-19 in patients with mental disorders.

Methods This retrospective study was conducted from January 2021 until January 2022 and included 458 patients with mental disorders treated at the Dr Laza Lazarević Clinic for Mental Disorders in Belgrade, Serbia. Patients were segregated into the vaccinated and unvaccinated group depending on their vaccination status. Questionnaire developed specifically for the present study was administered to gather the participants' sociodemographic characteristics, while data related to their mental disorders, COVID-19 infection, and comorbidities was obtained from their medical records.

Results Eighty percent of the vaccinated group opted for the Sinopharm vaccine. Significantly higher percentage of vaccinated patients was hospitalized during the study period and had comorbidities compared to the unvaccinated group (51.4% vs. 32.6% and 52.8% vs. 37.5%, respectively). Education level, employment status, marital status, diagnostic category, and comorbidities were statistically significant predictors of COVID-19 vaccination uptake among people with mental disorders.

Conclusion Our findings show that higher level of education, greater trust in the healthcare system, and knowledge of the available vaccination points significantly contribute to the vaccination uptake in this vulnerable population group.

Keywords: COVID-19; mental disorders; vaccination

САЖЕТАК

Увод/Циљ Забележене су веће стопе обољевања и морталитета од инфекције ковида 19 међу особама са менталним сметњама, посебно код оних који болују од тешких форми, због тога њима треба дати приоритет током вакцинације. Циљ ове студије био је да се испитају могући предиктори прихватања вакцинације против инфекције ковида 19 код болесника са менталним сметњама.

Методе Ова ретроспективна студија спроведена је од јануара 2021. до јануара 2022. године и обухватила је 458 болесника са менталним сметњама, лечених у Клиници за психијатријске болести „Др Лаза Лазаревић“ у Београду. Испитаници су подељени у две групе, вакцинисани и невакцинисани у зависности од вакциналног статуса. За потребе студије израђен је посебан упитник, како би се прикупили социјалнодемографски подаци испитаника, док су подаци који су се односили на ментални статус, инфекцију ковида 19 и коморбидитете добијени из њихових историја болести.

Резултати Осамдесет одсто вакцинисаних се определило за *Синофармову* вакцину. Значајно већи проценат вакцинисаних болесника био је хоспитализован током периода истраживања и имао је коморбидитете у односу на невакцинисану групу (51,4% према 32,6% и 52,8% према 37,5%). Ниво образовања, статус запослења, брачни статус, дијагностичка категорија и коморбидитети били су статистички значајни предиктори прихватања вакцинације против инфекције ковида 19 код особа са менталним сметњама.

Закључак Резултати наше студије показују да виши степен образовања, веће поверење у здравствени систем и познавање доступних вакциналних места значајно доприносе прихватању вакцинације код ове осетљиве групе становништва.

Кључне речи: ковид 19; менталне сметње; вакцинација

INTRODUCTION

In December 2020, a massive worldwide vaccination campaign commenced, aiming to protect the global population against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which causes COVID-19. Several vaccines based on different modes of action (i.e., mRNA, viral vector, whole virus, and protein subunit) are currently licensed, and their efficacy and safety profile has been demonstrated in several epidemiological studies [1, 2, 3]. Each of the available SARS-CoV-2 vaccines has been developed, evaluated, and approved

according to the current scientific knowledge and the applicable regulatory guidelines and legal requirements [4].

While vaccination uptake has been satisfactory, it varies not only among countries, but also across different social categories. As higher rates of COVID-19 morbidity and mortality have been recorded among people with mental disorders, especially those suffering from severe mental illness, they should be prioritized during vaccination campaigns [5]. These persons are vulnerable, as they may have difficulty in adhering to the prescribed prevention measures [6] due to the compromised capacity to understand the guidelines or adapt their behavior to limit the risk of contracting the infection [7]. Accordingly, they were among the first population groups to be offered vaccines in several countries [8], but multidimensional strategy is still needed to enhance the healthcare access and to reduce discrimination and stigmatization of vulnerable individuals [9].

These objectives have motivated the present study, as a part of which the possible predictors of COVID-19 vaccination uptake among people with mental disorders were examined.

METHODS

This retrospective study was conducted from January 2021 until January 2022 and included 458 patients with mental disorders treated at the Clinic for Mental Disorders “Dr Laza Lazarević” Belgrade, Republic of Serbia. Each patient had a diagnosis of mental disorder according to the 10th. Revision of the International Classification of Diseases (ICD-10). Prior to commencing the research, approval for all study protocols was obtained from the Ethics Committee of the Dr Laza Lazarević Clinic for Mental Disorders in Belgrade, Serbia (No. 3009, 21/02/23). The participation was voluntary and each patient was informed, through a special brochure, about the type and aims of the study, the data collection procedure, the nature of their involvement, and other relevant aspects. Only patients that provided written consent for using their personal data for study purposes either directly or through a legal representative were eligible for participation.

The recruited patients were segregated into the vaccinated and unvaccinated group depending on their vaccination status. The vaccinated group consisted of 233 patients with mental disorders (132 males and 101 females; mean age 44.3 ± 11.3 years). These individuals received a minimum two doses of COVID-19 vaccine at the Clinic for Mental Disorders “Dr

Laza Lazarević” Belgrade, Republic of Serbia. The unvaccinated group comprised age- and gender-matched 234 patients with mental disorders (127 males and 97 females; mean age 43.6 ± 10.5 years). In order to examine factors that may contribute to the decision to accept/reject vaccination, a questionnaire developed specifically for the present study was administered to gather the participants’ sociodemographic characteristics, while data related to their mental disorders, COVID-19 infection, and comorbidities was obtained from their medical records.

Statistical analysis

The obtained data was subjected to statistical analyses, performed using IBM SPSS Statistics 22 (IBM Corporation, Armonk, NY, USA). Results were presented as frequency (percentage), median (range), and mean \pm standard deviation (SD). For parametric data, independent samples t-test was performed to test differences between groups, whereas numeric data with non-normal distribution and ordinal data were subjected to Mann-Whitney U test. Chi-squared test or Fisher’s exact test was performed to test differences in nominal data (frequencies), and logistic regression analysis was conducted to assess binary outcome (local and systemic adverse events) and identify potential predictors. All p-values less than 0.05 were considered statistically significant. Independent variables which were statistically significant ($p < 0.1$) in univariate logistic regression models were incorporated into the multivariate logistic regression model as the independent variables.

RESULTS

The study included a total of 458 subjects with mental disorders, they were segregated into the vaccinated and unvaccinated group. The vaccinated group consisted of 233 patients with mental disorders (132 males and 101 females; mean age 44.3 ± 11.3 years. The unvaccinated group comprised age- and gender-matched 234 patients with mental disorders (127 males and 97 females; mean age 43.6 ± 10.5 years). Based on the socio-demographic characteristics, reported in Table 1, it is evident that unemployed and unmarried individuals predominated in both groups, but the difference was statistically significant (60.9% vs. 63.7% and 76.4% vs. 72.8%, respectively). The percentage of subjects from urban areas was significantly higher than those from periurban areas (vaccinated group 98.3% vs. 1.7%, unvaccinated group 97.8% vs. 2.2%, respectively). The two groups also differed with respect to the hospitalization rates due to the diagnosed mental disorder and comorbidities.

As shown in Figure 1, 179 (76.8%) of the vaccinated group opted for the Sinopharm vaccine. The results showed that a significantly smaller number of patients were vaccinated with Pfizer (32 subjects or 13.7%) and Astra Zeneca (22 subjects or 9.4%) vaccines.

As indicated in Table 2, a significantly higher percentage of vaccinated patients was hospitalized during the study period and they had comorbidities compared to the unvaccinated group (51.4% vs. 32.6% and 52.8% vs. 37.5%, respectively). There were no statistically significant differences in COVID-19 disease history and COVID-19 hospitalization between the group vaccinated patients and unvaccinated patients.

According to the multivariate logistic regression model, education level, employment status, marital status, diagnostic category, and comorbidities were statistically significant predictors of COVID-19 vaccination uptake among people with mental disorders. Namely, vaccination rates were higher among patients with mental disorders who have completed higher education, who are retired, as well as those who are single or divorced compared to those who have no formal education or have only completed elementary school, are employed, and are in a relationship (Figure 2).

DISCUSSION

Within a few months of the first reported cases, COVID-19 caused a worldwide pandemic [10], prompting multiple groups of scientists across the globe to work on a vaccine. Following extensive testing, several vaccine types entered the market in December of 2020. As vaccination has historically been the most effective measure in the fight against viral disease (flu, SARS, H1N1, etc.) epidemics [11], the aim was to vaccinate as many individuals as possible. As a vulnerable group, individuals with mental health disorders were in focus of the present study, and our analyses revealed that almost 80% of those that chose to be vaccinated received the Sinopharm vaccine. This finding was expected, as the Sinopharm vaccine was the first to arrive in Serbia and was the most available vaccine type at the vaccination points. As a result, majority of the population was vaccinated with this vaccine [12]. The vaccinated patients did not significantly differ from the unvaccinated group in terms of education, thus countering the results obtained in other studies indicating that better educated individuals generally have a more positive attitude toward vaccination [13, 14, 15]. However, as our cohort comprised solely of patients with mental health disorders (many of whom suffered from schizophrenic

psychoses), they would have a lower educational level compared to the general population, rendering the results incomparable.

On the other hand, there were statistically significantly fewer employed individuals the vaccinated relative to the unvaccinated group. Once again, this finding differs from the results obtained in most studies related to psychiatric patients as well as general population, in which unemployment is shown to be associated with greater resistance to vaccination [16, 17]. The number of retired individuals was higher in the vaccinated group. If retirement is considered as a proxy for old age, this finding is supported by the results reported by other authors, indicating that elderly people with mental disorders are more likely to opt for vaccination [13, 18].

It is also worth noting that about 98% of the study participants (irrespective of their vaccination status) resided in an urban environment. Thus, as the sample was relatively small and homogenous, the obtained findings likely do not apply to other parts of Serbia, given that vaccination rates in rural areas are typically lower [14].

Analyses related to the marital status further revealed that there were statistically significantly fewer married persons in the vaccinated than in the unvaccinated group, concurring with the findings obtained by Israeli scientists who examined the factors influencing the motivation for vaccination in people with schizophrenia, and found that vaccinated respondents with schizophrenia were less likely to be married compared to healthy controls [18]. One of the possible explanations for this finding is that, if unmarried people with mental disorders have confidence in their psychiatrist, they will follow the medical advice and get vaccinated. The importance of the role of psychiatrists in the vaccination of persons with mental disorders during the COVID-19 pandemic was confirmed in several previous studies [19, 20, 21]. As noted earlier, over 90% of the patients in our entire sample have a diagnosis from the F20–F29 spectrum due to the types of psychopathology typically treated at our clinic.

We also found that, compared to the unvaccinated group, a significantly greater number of patients in the vaccinated group were hospitalized due to deterioration in their mental state during the study period. It is thus possible that, during their hospital stay, these patients were motivated by psychiatrists and other medical workers to get vaccinated, and took this opportunity to do so, given that the vaccine could be administered on the ward. These assertions are supported by the prior findings indicating that vaccination during hospital treatment was a good strategy for increasing the vaccination coverage of this vulnerable group [22, 23].

Extant research also shows that people with mental disorders are in more significant risk of SARS CoV-2 infection [24, 25]. Over 90% of our cohort did not contract the virus within the study period, likely due to the strong public health measures that were in force in Serbia during the peak of the epidemic. As these findings could also potentially be attributed to the personal attitudes, lifestyle, and habits of people with mental disorders during the pandemic, these factors should be examined as a part of future research.

As only 10% of the sample had COVID-19 infection, no statistically significant differences could be established in the hospitalization rates due to COVID-19 between the vaccinated and the unvaccinated group, indicating that this is another aspect that warrants additional studies based on larger samples. Still, among the 20 infected patients who were previously vaccinated, 12 (60%) required hospital treatment to combat the COVID-19 infection, while all six (100%) previously unvaccinated patients that acquired COVID-19 required hospitalization during the observed period. While these numbers are low, they are in line with the findings obtained in other studies around the world which have unequivocally demonstrated the importance of vaccination in reducing the infection rates as well as the severity of the disease [26].

Our analyses also revealed a significantly greater number of patients with comorbidities in the vaccinated relative to the unvaccinated group, which is in accordance with the data reported in pertinent literature [18]. These findings could potentially be attributed to the ample body of publicly available information indicating that comorbidities increase the risk of developing serious complications due to COVID-19 infection, which are more likely to result in a fatal outcome [27]. The fear of needing hospitalization, intensive care or a ventilator may have motivated these patients to get vaccinated [19]. Therefore, as the vaccinated group had a greater number of comorbidities on average, this factor might have contributed to the greater COVID-19-related hospitalization rates in this group.

Psychiatrists play a very important role in supporting the healthcare system in creating culturally and contextually adapted public health messages in order to overcome resistance to vaccination. Patients with more severe mental disorders – such as psychotic spectrum disorders, who comprised 90% of our sample – have additional, individual challenges that may interfere with the decision to vaccinate against COVID-19. They include lack of knowledge, neurocognitive impairment, low digital literacy, lower educational attainment, reduced ability to reason rationally, and negative mental states such as apathy and avolition [28].

Given that the patients that took part in the present study had no external barriers (such as limited vaccine availability or access to the vaccination points), it is certain that the reasons for non-vaccination and resistance were exclusively of an individual nature. Thus, we concur with the findings of a literature review conducted by Lim et al. [29] indicating that a multi-level approach is required to increase the COVID-19 vaccination uptake among patients with psychiatric diseases, which should be tailored depending on the presence and degree of resistance to vaccination, as well as the analysis of possible reasons for resistance.

In overcoming these obstacles, psychiatrists can use their medical knowledge, but also specific cognitive-behavioral and motivational interviewing techniques, which makes them ideal vaccination ambassadors, bearing in mind their frequent contact with these patients and the unique knowledge and skillset they possess. As these experts have long-term and trust-based strong therapeutic alliances with their patients, they are also in a position to address both rational beliefs and irrational ideas about vaccination [29, 30].

CONCLUSION

Further studies are needed to determine whether people with particular mental disorders have a higher risk of SARS-CoV-2 infection and severe COVID-19. Therefore, persons with mental disorders represent a vulnerable group as they are more likely to acquire infection under epidemic conditions, and should therefore also be the target for specific motivational initiatives aimed at raising public awareness about the importance of vaccination. Our findings show that higher level of education, greater trust in the healthcare system, and knowledge of the available vaccination points significantly contribute to the vaccination uptake in this vulnerable population group.

Conflict of interest: None declared.

REFERENCES

1. Polack FP, Thomas SJ, Kitchin N, Absalon J, Gurtman A, Lockhart S, et al. C4591001 Clinical Trial Group Safety and efficacy of the BNT162b2 mRNA covid-19 vaccine. *N Engl J Med* 2020 Dec 31;383(27):2603–2615; PMID: 33301246.
2. Knoll MD, Wonodi, C. Oxford-AstraZeneca COVID-19 vaccine efficacy. *Lancet* 2021 Dec 8;397(10269):72–74. doi:10.1016/S0140-6736(20)32623-4; PMID:33306990
3. Vitiello A, Pelliccia C, Ferrara F. Drugs acting on the renin–angiotensin system and SARS-CoV-2. *Drug Discov Today*. 2021;26(4):870–874. doi:10.1016/j.drudis.2021.01.010; PMID: 33486116
4. COVID-19 Vaccines: Development, Evaluation, Approval and Monitoring. Available from: <https://www.ema.europa.eu/en>
5. Yalçın M, SönmezGüngör E, Ergelen M, BeşikçiKeleş D, YerebakanTüzer M, ÖcekBaş T, et al. Characteristics and outcomes of psychiatric inpatient with severe mental illness and COVID-19: Experience from a COVID-19-Specific acute psychiatric ward in Istanbul. *J NervMent Dis*. 2021 Dec 1;209(12):884–891. doi: 10.1097/NMD.0000000000001450;PMID: 34710895
6. Courtenay K. Covid-19: challenges for people with intellectual disability. *BMJ*. 2020 Sep;37(3):231–236. doi: 10.1136/bmj.m1609; PMID: 32349992
7. Nooraeen S, Bazargan-Hejazi S, Naserbakht M, Vahidi C, Shojaerad F, Mousavi SS, et al. Impact of COVID-19 pandemic on relapse of individuals with severe mental illness and their caregiver's burden. *Front. Public Health* 2023;11:1086905. doi: 10.3389/fpubh.2023.1086905;PMID: 36817882
8. Peritogiannis V, Drakatos I, Gioti P, Garbi A. Vaccination rates against COVID-19 in patients with severe mental illness attending community mental health services in rural Greece. *Int J Soc Psychiatry*. 2022 Feb;69(1):208–215.doi: 10.1177/00207640221081801;PMID: 35253527
9. Grune J, Savelser D, Kobus M, Linder A, Herrmann W, Schuster A. Determinants of COVID-19 vaccine acceptance and access among people experiencing homelessness in Germany: A qualitative interview study. *Front. Public Health* Sec. 2023 Mar 24;11:1148029.doi:10.3389/fpubh.2023.1148029; PMID:32838242.
10. World Health Organization. WHO EDirector-General's Opening Remarks at the Media Briefing on COVID-19-11 March2020. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020> (access March 11, 2020).
11. Haeuser E, Serfes AL, Cork MA, Yang M, Abbastabar H, Abhilash ES, et al. Local Burden of Disease sub-Saharan Africa HIV Prevalence Collaborators. Mapping age- and sex-specific HIV prevalence in adults in sub-Saharan Africa, 2000–2018. *BMC Med*. 2022 Dec 19;20(1):488. doi: 10.1186/s12916-022-02639-z. PMID: 36529768.
12. Marković M. Imunski odgovor na SARS-CoV-2 i pregled vakcina protiv COVID-19. *Medicinski podmladak*, 2021;72(3):20–29. doi:10.5397/mp72-33315.
13. Pandolfo G, Genovese G, Iannuzzo F, Bruno A, Pioggia G, Gangemi S. COVID-19 Vaccination and Mental Disorders, What Has Been Accomplished and Future Direction. *Brain Sci*. 2022 Feb 20;12(2):292. doi: 10.3390/brainsci12020292. PMID: 35204055.
14. Murphy J, Vallières F, Bentall RP, Shevlin M, McBride O, Hartman TK, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun*. 2021 Jan 4;12(1):29. doi: 10.1038/s41467-020-20226-9. PMID: 33397962.
15. Eyllon M, Dang AP, Barnes JB, Buresh J, Peloquin GD, Hogan AC, et al. Nordberg SS. Associations between psychiatric morbidity and COVID-19 vaccine hesitancy: An analysis of electronic health records and patient survey. *Psychiatry Research*. 2022 Jan;307:114329.ISSN 0165-1781; PMID:34910966.

16. Bai W, Cai H, Jin Y, Zhang Q, Cheung T, Su Z, et al. COVID-19 vaccine hesitancy in community-dwelling and hospitalized patients with severe mental illness. *Psychological Medicine*. 2023 Jul;53(9):4288-4290. doi:10.1017/S0033291721004918; PMID:34915962.
17. Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine* 2020 Sep;26:100495. doi: 10.1016/j.eclinm.2020.100495; PMID:32838242.
18. Tzur Bitan D, Kridin K, Cohen AD, Weinstein O. COVID-19 hospitalisation, mortality, vaccination, and postvaccination trends among people with schizophrenia in Israel: a longitudinal cohort study. *Lancet Psychiatry*. 2021 Oct;8(10):901-908. doi: 10.1016/S2215-0366(21)00256-X. Epub 2021 Aug 6. PMID: 34364406.
19. De Picker LJ. Closing COVID-19 mortality, vaccination, and evidence gaps for those with severe mental illness. *Lancet Psychiatry*. 2021 Oct;8(10):854-855. doi: 10.1016/S2215-0366(21)00291-1. Epub 2021 Aug 6. PMID: 34364405.
20. Lim C, Van Alphen MU, Maclaurin S, Mulligan C, Macri, B, Cather C, et al. Increasing COVID-19 Vaccination Rates Among Patients with Serious Mental Illness: A Pilot Intervention Study. *Psychiatric Services*. 2022 Nov 1;73(11):1274-1277. doi: 10.1176/appi.ps.202100702; PMID:35414188.
21. Stewart DE, Appelbaum PS. COVID-19 and psychiatrists' responsibilities: a WPA position paper. *World Psychiatry*. 2020 Oct;19(3):406-407. doi: 10.1002/wps.20803. PMID: 32931089.
22. Jeon HL, Kwon JS, Park SH, Shin JY. Association of mental disorders with SARS-CoV-2 infection and severe health outcomes: nationwide cohort study. *Br J Psychiatry*. 2021 Jun;218(6):344-351. doi: 10.1192/bjp.2020.251; PMID: 33407954.
23. Hooper K, Hooper M, Nguyen J, Fukutomi A. Are you vaccinated? COVID-19 vaccination rates and the effect of a vaccination program in a metropolitan mental health inpatient population in Australia. *Australas Psychiatry*. 2023;31(1):38-42. doi:10.1177/10398562221136756; PMID:36337038.
24. Danenberg R, Shemesh S, Tzur Bitan D, Maoz H, Saker T, Dror C, et al. Attitudes of patients with severe mental illness towards COVID-19 vaccinations: A preliminary report from a public psychiatric hospital. *J Psychiatr Res*. 2021 Nov;143:16-20. doi: 10.1016/j.jpsychires.2021.08.020. Epub 2021 Aug 20. PMID: 34438198.
25. Wang Y, Yang Y, Ren L, Shao Y, Tao W, Dai XJ. Preexisting Mental Disorders Increase the Risk of COVID-19 Infection and Associated Mortality. *Front Public Health*. 2021 Aug 9;9:684112. doi: 10.3389/fpubh.2021.684112. PMID: 34434913.
26. Guo Y, Cheng C, Zeng Y, Li Y, Zhu M, Yang W, et al. Mental Health Disorders and Associated Risk Factors in Quarantined Adults During the COVID-19 Outbreak in China: Cross-Sectional Study. *J Med Internet Res*. 2020;22(8):e20328. doi: 10.2196/20328; PMID:32716899.
27. Machado BAS, Hodel KVS, Fonseca LMDS, Pires VC, Mascarenhas LAB, da Silva Andrade LPC, et al. The Importance of Vaccination in the Context of the COVID-19 Pandemic: A Brief Update Regarding the Use of Vaccines. *Vaccines (Basel)*. 2022 Apr 12;10(4):591. doi: 10.3390/vaccines10040591. PMID: 35455340.
28. Adab P, Haroon S, O'Hara ME, Jordan RE. Comorbidities and covid-19. *BMJ*. 2022 Jun 15;377:o1431. doi: 10.1136/bmj.o1431. PMID: 35705219.
29. Lim C, Van Alphen MU, Freudenreich O. Becoming vaccine ambassadors: A new role for psychiatrists *Current Psychiatry*. 2021 Aug;20(8):10-11,17-21,26-28,38 doi:10.12788/cp.0155
30. Mazereel V, Van Assche K, Detraux J, De Hert M. COVID-19 vaccination for people with severe mental illness: why, what, and how? *Lancet Psychiatry*. 2021 May;8(5):444-450. doi: 10.1016/S2215-0366(20)30564-2. Epub 2021 Feb 3. PMID: 33548184.

Table 1. Sociodemographic characteristics and medical data of vaccinated and unvaccinated patients with mental disorders.

Variable	Vaccinated patients n (%)	Unvaccinated patients n (%)	OR (95% CI)	p-value
Gender: male female	132 (56.7) 101 (43.3)	127 (56.7) 97 (43.3)	1.02 (0.7–1.47)	0.927
Age (in years): M ± SD	44.3 ± 11.3	43.6 ± 10.5	1.01 (0.99–1.02)	0.553
Educational level: no education/elementary school secondary school high school university or higher	37 (15.9) 163 (70) 19 (8.2) 14 (6)	25 (11.2) 154 (68.8) 34 (15.2) 11 (4.9)	<u>reference:</u> 0.72 (0.41–1.24) 0.35 (0.16–0.75) 0.86 (0.34–2.20)	0.235 0.007 0.753
Employment: employed unemployed retired	26 (11.2) 142 (60.9) 65 (27.9)	44 (19.6) 142 (63.4) 38 (17.0)	<u>reference:</u> 1.69 (0.99–2.90) 2.78 (1.48–5.20)	0.055 0.001
Residence: urban area periurban area	229 (98.3) 4 (1.7)	219 (97.8) 5 (2.2)	0.77 (0.21–2.91)	0.702
Marital status: married unmarried divorced widowed	29 (12.4) 178 (76.4) 21 (9.1) 5 (2.1)	45 (20.1) 163 (72.8) 12 (5.4) 4 (1.8)	<u>reference:</u> 1.79 (1.07–3.00) 2.88 (1.23–6.73) 2.05 (0.51–8.30)	0.026 0.015 0.312
Diagnostic category: non-psychotic disorder psychotic disorder	21 (9) 212 (91)	10 (4.5) 214 (95.5)	0.47 (0.22–1.02)	0.055
Comorbidities: yes no	123 (52.8) 110 (47.2)	84 (37.5) 140 (62.5)	1.83 (1.26–2.66)	0.002

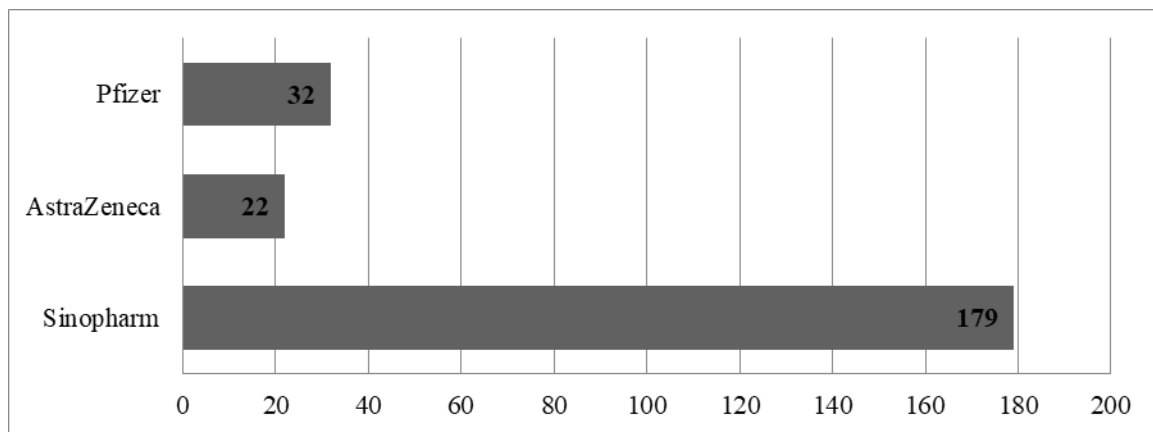


Figure 1. Distribution of COVID-19 vaccine type among vaccinated patients

Table 2. Rehospitalization due to the diagnosed mental disorder and COVID-19 data of vaccinated and unvaccinated patients with mental disorders

Variable	Vaccinated patients n (%)	Unvaccinated patients n (%)	p-value*
Hospitalization due to the mental disorder:			
yes	126 (54.1)	73 (32.6)	< 0.001
no	107 (45.9)	151 (67.4)	
COVID-19 disease history:			
yes	20 (8.6)	6 (2.7)	0.896
no	213 (91.4)	218 (97.3)	
COVID-19 hospitalization:			
yes	12 (5.2)	6 (2.7)	0.175
no	221 (94.8)	218 (97.3)	

*Fisher or χ^2 test

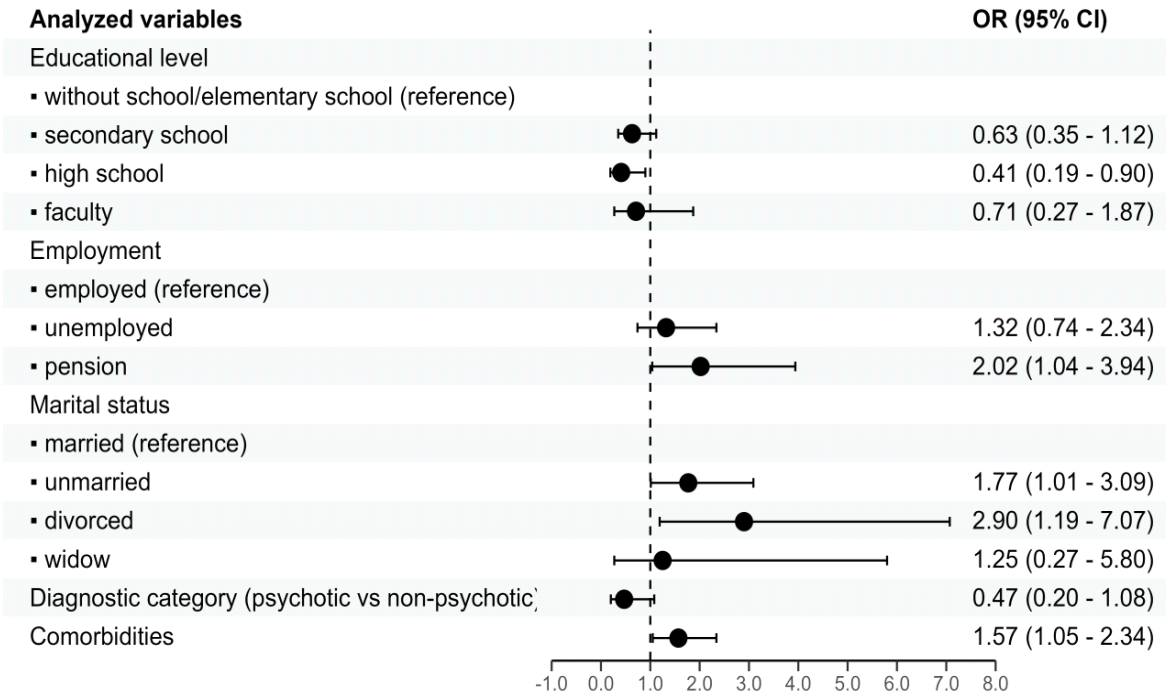


Figure 2. Multivariate logistic regression analysis results